

Inland Waterways Tributaries

Role and Value to the Inland Navigation System



The nation's inland waterway system includes nearly 12,000 miles of inland and intracoastal waterways. The system centers on the mainstem arteries of the Mississippi, Ohio, Illinois, and Tennessee Rivers and the Gulf Intracoastal Waterway.

But more than a dozen key tributary waterways feed traffic to and from the mainstem channels and permit vital economic development in communities far removed from the principal waterways.

In addition, the Atlantic Intracoastal Waterway and the Columbia-Snake System in the Pacific Northwest are each physically separate from the main system, but play an important role in the economies of their regions.

In addition to commercial navigation, many of these tributary waterways also provide flood protection, hydropower, recreation, water supply and irrigation.

This presentation takes a look at the role of these waterways as links in a *system* and suggests some new tools to assess their regional and national economic contributions.

“...18 of the Inland Waterway System’s 29 segments move less than three percent of the nation’s barge traffic while consuming more than 30 percent of the system’s Operations and Maintenance costs.”

-- Scott Faber, American Rivers, in testimony before the Senate Committee on Environment and Public Works, Subcommittee on Transportation and Infrastructure, May 16, 2000.

Question: Is this true?



Recently, there has been criticism of the level of funding for operations and maintenance (O&M) of tributary waterways. Such criticism has been voiced in congressional testimony and in the media. In particular, it has been suggested that selected tributary waterways carry less than 3% of inland waterway traffic but consume 30% of inland navigation O&M.

Well...almost. From one perspective: Ton-Miles by Segment

| O&M Cost, Total and per Ton-Mile, Fuel Taxed Waterway System, 1990-94 | | | | | | |
|---|-------------------------|-----------------------------------|--|--|-----------------------------|---------------------------|
| | Segment | Length in Operation (miles) | Average Annual Ton-Miles on Waterway (000) | Average Annual O&M Cost \$(000) | Percent of Ton- Miles | Percent of O&M Cost |
| 1 | Lower Mississippi | 720 | 116,392,506 | 58,895.55 | 44.1% | 13.920% |
| 2 | Ohio | 981 | 58,465,957 | 45,391.90 | 22.2% | 10.728% |
| 3 | Gulf Intracoastal WW | 1134 | 21,353,637 | 32,773.44 | 8.1% | 7.746% |
| 4 | Middle Mississippi | 195 | 18,594,214 | 11,765.14 | 7.0% | 2.781% |
| 5 | Upper Mississippi | 663 | 15,641,025 | 87,238.70 | 5.9% | 20.618% |
| 6 | Illinois | 349 | 9,024,253 | 16,431.54 | 3.4% | 3.883% |
| 7 | Tennessee | 652 | 6,876,376 | 11,406.32 | 2.6% | 2.696% |
| 8 | Black Warrior/Tombigbee | 453 | 5,876,988 | 13,367.28 | 2.2% | 3.159% |
| 9 | Arkansas | 448 | 1,814,784 | 25,558.22 | 0.7% | 6.041% |
| 10 | Kanawha | 91 | 1,537,022 | 8,447.72 | 0.6% | 1.997% |
| | Subtotal | 5686 | 255,576,762 | 311,276 | 96.9% | 73.6% |

By one measure – ton-miles on each segment – there is an element of truth in this. The 10 highest use waterways together comprise about 97% of total inland waterway ton-miles and about 74% of inland waterway O&M.

| O&M Cost, Total and per Ton-Mile, Fuel Taxed Waterway System, 1990-94 | | | | | |
|---|-----------------------------------|--|--|-----------------------------|---------------------------|
| Segment | Length in Operation (miles) | Average Annual Ton-Miles on Waterway (000) | Average Annual O&M Cost \$(000) | Percent of Ton- Miles | Percent of O&M Cost |
| 1 Monongahela | 129 | 1,441,407 | 12,886.99 | 0.546% | 3.046% |
| 2 Columbia/Snake | 276 | 1,387,730 | 7,768.86 | 0.526% | 1.836% |
| 3 Cumberland | 314 | 1,342,155 | 7,901.68 | 0.509% | 1.868% |
| 4 Tennessee-Tombigbee WW | 234 | 984,071 | 15,740.24 | 0.373% | 3.720% |
| 5 Missouri | 735 | 639,329 | 6,027.98 | 0.242% | 1.425% |
| 6 Atchafalaya/Old | 121 | 587,550 | 1,507.42 | 0.223% | 0.356% |
| 7 Green/Barren | 108 | 525,543 | 1,320.93 | 0.199% | 0.312% |
| 8 Red | 236 | 368,405 | 5,497.62 | 0.140% | 1.299% |
| 9 AIWW / IWW | 1,192 | 356,604 | 17,705.40 | 0.135% | 4.185% |
| 10 Alabama/Coosa | 314 | 149,604 | 7,372.90 | 0.057% | 1.743% |
| 11 Ouachita/Black | 351 | 127,259 | 4,426.78 | 0.048% | 1.046% |
| 12 White | 244 | 82,616 | 1,996.09 | 0.031% | 0.472% |
| 13 ACF | 291 | 66,024 | 8,427.14 | 0.025% | 1.992% |
| 14 Kaskaskia | 36 | 55,587 | 1,719.62 | 0.021% | 0.406% |
| 15 Allegheny | 72 | 50,475 | 7,975.50 | 0.019% | 1.885% |
| 16 Kentucky | 82 | 17,118 | 2,162.43 | 0.006% | 0.511% |
| 17 Willamette | 26 | 8,587 | 774.59 | 0.003% | 0.183% |
| 18 Pearl | 58 | 7 | 625.84 | 0.000% | 0.148% |
| Subtotal | 4,819 | 8,190,071 | 111,838 | 3.1% | 26.4% |
| Total | 10,505 | 263,766,833 | 423,113.82 | 100.000% | 100.000% |

The next 18 smaller waterways handle just over 3% of ton-miles and average a little over 26% of O&M. But what does this really tell us? This only measures the ton-miles occurring over the length of individual waterways. It ignores where this traffic is coming from or going to. It implies that the tributaries are a poor use of O&M funds because they do not carry the same density of traffic as the mainstems.

The reality is that such a comparison is flawed because it ignores the contribution of these very tributaries to total traffic moving on the mainstems. And it ignores the value of transportation savings afforded by these waterways and their contribution to the regional and national economies.

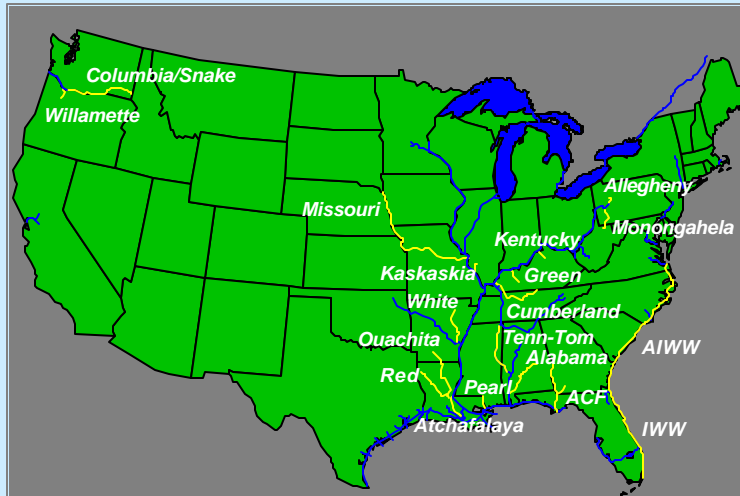
What else should we consider?

- Tributaries are part of a waterways system
- For tribs connecting to a mainstem:
 - 72.6 % of the tributary tons, and
 - 98.6% of the tributary ton-miles

derived from traffic that moves onto or off of the tributary from an origin or destination on another waterway.

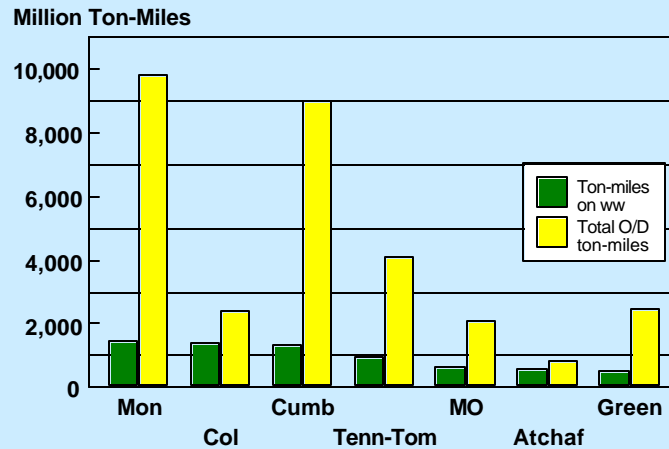
A more appropriate measure of the contribution of these tributaries is to assess their traffic in a system context. Like secondary roads or neighborhood streets, the tributaries provide a means of access to a main artery. TVA conducted a review of 1998 origin and destination waterborne commerce data. Their analysis indicates that nearly 73% of the tons, and nearly 99% of the ton-miles of tributary traffic moves to or from another waterway segment. So just looking at the tons or ton-miles on a tributary tells us little about the economic impact of that traffic. We need to know the commodity being shipped and we need to know its ultimate origin and destination.

“Tributaries” support an Inland Waterways *System*



For perspective, let's look at which waterways we're talking about. Other than the AIWW and the Columbia-Snake-Willamette, most of these waterways truly are “tributaries” of the mainstem system. Other than the Missouri, most are relatively short in length. And other than Tenn-Tom, these are not “through” routes, but terminate at a head of navigation, often in a region of low to medium population density and with limited economic development. By their very nature these waterways are destined to have fewer ton-miles simply because they have fewer miles over which their traffic moves, and because they are connecting end-of-the-line smaller communities and regions with markets throughout the mainstem waterways.

Tributary traffic moves throughout the waterway system

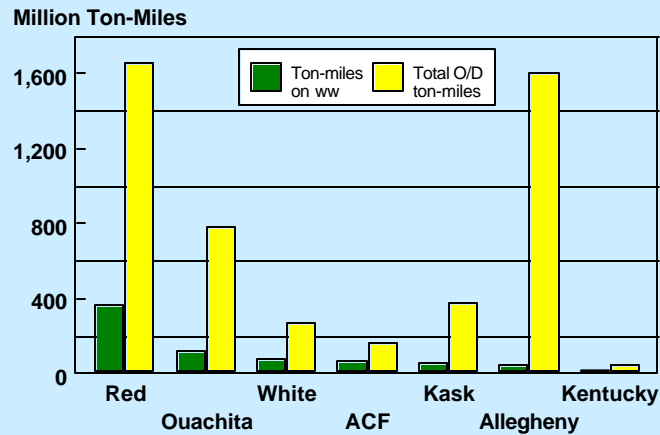


It is important to look at this connection with the rest of the system to get a sense of the contribution of tributary waterways. The ton-miles carried just on a waterway segment does not tell us anything about where the traffic is coming from or going to.

But looking at the total ton-miles for movements that originate or terminate on a tributary highlights the interconnectivity of the system as a whole. The Monongahela and Cumberland illustrate this point dramatically. Ton-miles on the Mon itself average 1.4 billion, but if we look at the total ton-miles for those movements that begin or end on the Mon, the volume approaches 10 billion.

Likewise on the Cumberland, ton-miles average 1.3 billion on the river itself, but the total for movements that begin or end on the Cumberland is over 9 billion. The point is, just looking at the ton-miles moving on a tributary tells us only a small part of the story about the importance of that traffic to the system as a whole.

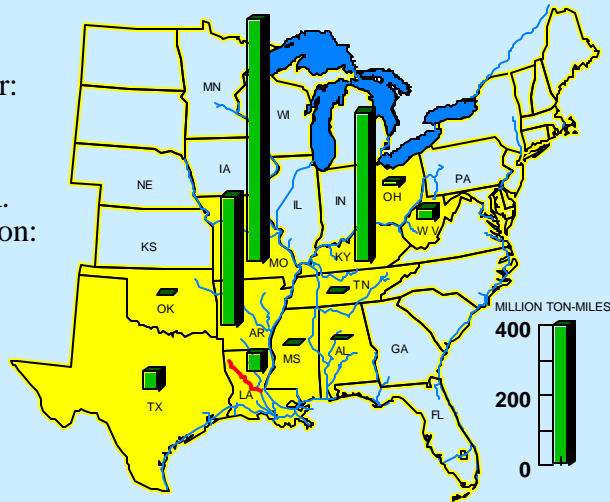
Even smaller tribs generate traffic that moves throughout the system



The same pattern holds for even the smallest of tributaries. The ton-miles associated with the entire movement for traffic that begins or ends on a trib is usually several times greater than the ton-miles directly taking place on the trib itself. But, without access to the terminals on that tributary waterway, that entire movement, and those total ton-miles, would not have occurred.

Red River Waterborne Commerce, 1998

- Total tons: 3.75 million
- Ton-miles on river: 304.6 million
- Ton-miles for all traffic with Red R. origin or destination: 1,659.5 million
- Ton-miles traded with MO: 694 m
- Ton-miles traded with KY: 427 m



The Red River has received media criticism that it is not fulfilling traffic projections made prior to construction. The data would seem to indicate otherwise. Total tons of 3.75 million are reportedly in line with projections.

But more significant is the rapid integration of the newly-opened Red with the rest of the system. While ton-miles on the Red itself amounted to 305 million (the Red is only 236 miles in length), that traffic moved extensively on the rest of the system to and from terminals in Kentucky, Missouri, Ohio, West Virginia and other states. The 305 million ton-miles on the Red actually generates over 1.6 billion ton-miles of traffic moving throughout the system. The Red's biggest trade partners are terminals in Missouri and Kentucky, not locally in Louisiana.

Tributary Ton-Miles in System Context

- While ton-miles occurring directly on tributary waterways may account for only **3.1%** of total waterway system ton-miles...
- Viewing that tributary traffic in terms of a total movement, by origin and destination, shows that it accounts for closer to **15%** of total system ton-miles.

Looking at tributary traffic in terms of the entire movement gives a better perspective of their contribution to total system traffic. While the ton-miles directly moving on the tribs may be just over 3% of the system total, looking at that traffic in terms of its origin and destination shows the trib contribution to be more on the order of 15% of the system total.

Tribs are more than just navigation...

- **Regional Development**
 - Industries – jobs – can locate in communities away from the main stems
- **Multipurpose**
 - Flood protection
 - Hydropower
 - Recreation
 - Water Supply
- **Defense and readiness**



Old Hickory L&D
Cumberland River



Woodruff L&D
Lake Seminole

And we shouldn't forget that commercial navigation is only one of the project purposes for many of these tributary waterways. Many have been constructed with regional development objectives. Project purposes may also include flood protection, hydropower, recreation, water supply and other purposes. The tribs also contribute to the defense readiness of the inland waterways as a whole.

Defense Use of Waterways

- Indiana Army National Guard deployment to Fort Polk, Louisiana, May 2000
- Canal Barge Co. carried 850 military vehicles
- Formed 64-barge tow
- 19 day trip, arriving 6 May in Alexandria, on Red River
- Easier to load/unload than rail
- Rails less interested in business

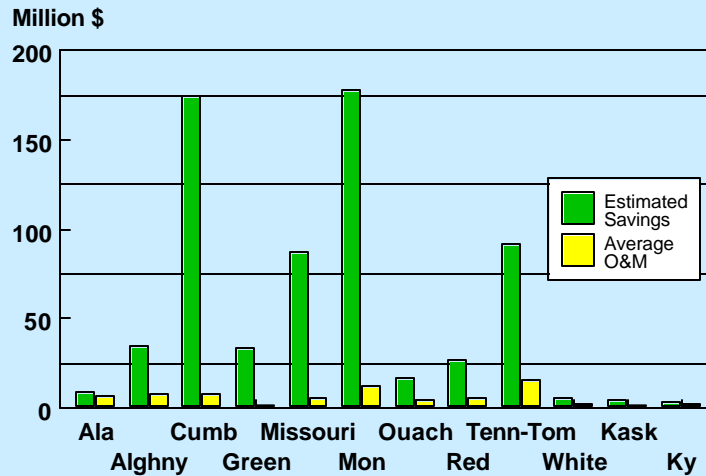


A case in point is the recent deployment of the Indiana Army National Guard to Fort Polk, Louisiana. Military vehicles and equipment were loaded on barges at points on the Illinois and Ohio Rivers, then consolidated into a 64-barge tow for movement down the Mississippi, then up the Red to Alexandria, Louisiana, where the flotilla was unloaded for the short overland movement to Fort Polk.

Vehicles could be driven on and off the deck barges. Equipment did not have to be drained of fuel or partially disassembled as they would have to be for rail shipment. This saved considerable time and manpower. Industry sources indicate they expect more military use of the waterways as rail systems focus on their commercial customers and show reluctance to handle such specialized movements.

Estimates of Transportation Savings on Tributary Waterways, 1998

based on nationwide average savings per ton, by commodity group



Perhaps a more appropriate way to assess the “value” of a tributary waterway would be to measure its impact in terms of transportation savings. That is a basic step in developing a traditional Corps benefit analysis for any proposed navigation project. Does a waterway produce transportation savings in terms of national resources, and do these savings exceed the cost? However, such an analysis would require a detailed review of barge transport and alternate mode transport costs, by origin and destination, for all commodity movements on a tributary waterway. Such a study would be an appropriate response to any serious consideration of no longer maintaining a waterway for navigation, but of course is not possible here.

However, we can do some rough “ballpark” estimates based on earlier studies. IWR developed estimates of average transportation savings by commodity group for inland waterway traffic in the early 1990s. These were nationwide averages based on comparing barge and rail linehaul transportation costs between the same origin and destinations, for over 3000 origin/destination pairs. Savings ranged from \$4.16/ton for coal to \$17.17/ton for industrial chemicals.

Applying these average savings by commodity to traffic moving on the tributaries provides a rough estimate of the transportation savings for that waterway. This represents a macro, national-based analysis, that does not truly represent the marginal transportation savings for the traffic moving on individual waterways. But since most of the tributary traffic moves to and from points throughout the waterway system, there is a basis for using national averages.

Bearing in mind the caveats, such an estimate of transportation “savings” indicates that most tributary waterways may produce savings to the economy that are several orders of magnitude greater than O&M expenditures for that waterway. The comparison of savings to O&M is particularly dramatic for the Cumberland, Green, Monongahela, Missouri, Allegheny and Tenn-Tom.

**Inland Waterway System Tributaries: Cost and Contribution
1998 Tons, Estimated Commodity Value & Transportation Savings,
and Average (90-94) O&M Cost**

| Waterway | Tons (000) | Commodity Value (000) | Transportation Savings (000) | 5-Year (90-94) Av O&M (000) | Ratio Savings/O&M |
|-------------------|---------------|--------------------------|---------------------------------|--------------------------------|----------------------|
| Green | 5,921 | 251,188 | 33,430 | 1,321 | 25.3 |
| Cumberland | 23,303 | 2,292,012 | 174,257 | 7,902 | 22.1 |
| Missouri | 8,344 | 1,098,191 | 87,737 | 6,028 | 14.6 |
| Willamette | 1,055 | 18,640 | 10,990 | 775 | 14.2 |
| Monongahela | 36,752 | 2,213,049 | 178,218 | 12,887 | 13.8 |
| Tenn-Tom | 8,510 | 1,571,879 | 92,079 | 15,740 | 5.8 |
| Red | 3,750 | 299,564 | 27,202 | 5,498 | 4.9 |
| Arkansas River | 12,033 | 3,259,480 | 125,480 | 25,558 | 4.9 |
| Allegheny | 3,871 | 479,368 | 35,291 | 7,976 | 4.4 |
| Ouachita-Black | 1,631 | 187,223 | 16,808 | 4,427 | 3.8 |
| AIWW | 3,701 | 1,490,851 | 50,713 | 17,705 | 2.9 |
| White | 476 | 98,557 | 5,509 | 1,996 | 2.8 |
| Kaskaskia | 784 | 78,605 | 4,330 | 1,720 | 2.5 |
| IWW-Jax to Miami* | 619 | 93,587 | 5,882 | 3,293 | 1.8 |
| Kentucky | 302 | 12,884 | 3,114 | 2,162 | 1.4 |
| Alabama-Coosa | 655 | 136,837 | 9,407 | 7,373 | 1.3 |
| ACF | 442 | 48,087 | 5,052 | 8,427 | 0.6 |

*1996 O&M data for IWW.

Sources: Tons: USACE Waterborne Commerce Statistics Center.

Value: Weighted domestic value from 1994 trade data compiled for Institute for Water Resources.

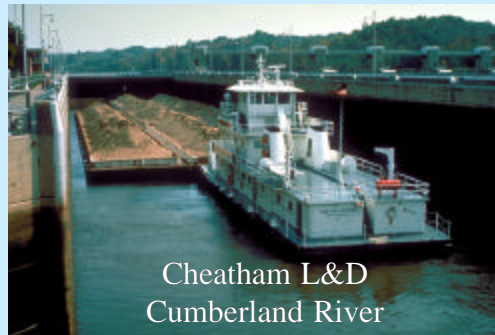
Savings: IWR analysis presented to the Inland Waterway Users Board Oct. 1991.

This table sorts the tributary waterways based on the ratio of estimated transportation savings (based on 1998 tonnages) to average O&M (1990-94). The value of traffic is based on a domestic weighted value by commodity using 1994 foreign trade data that was performed for IWR. In all cases except for the ACF and the Pearl (not shown), estimated transportation savings exceed average O&M – often by several orders of magnitude.

Again, this is a macro approach based on national averages and, ideally, transportation savings should be evaluated on a marginal savings basis for actual and alternative origins and destinations. But it does suggest an analytical tool that would more truly assess the “value” of tributary waterways as a return on an investment of federal resources.

Summary

- Tributary traffic is a vital contributor to the national waterway system
- Nearly all tribs appear to “pay their way” several times over in terms of transportation savings to the economy



In summary – the tributaries play a vital role linking more remote communities and regions with the mainstem inland waterway system. Traffic that originates or terminates on tributaries generate nearly 15% of total inland waterway ton-miles and probably well more than 15% of fuel tax revenues.

Moreover, estimates of transportation savings – although needing more detailed study – suggest that nearly all tributary waterways “pay their way” several times over as a return on the federal investment in O&M.